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| IN RE APPLICATION OF | : |
| KOICHI SAKAMOTO, ET AL. | : EXAMINER: SHEVIN, MARK L. |
| SERIAL NO: 10/564,061 | : |
| FILED: JANUARY 10, 2006 | : GROUP ART UNIT: 1793 |
| FOR: METHOD FOR PRODUCING HIGH CLEANNESS STEEL EXCELLENT IN FATIGUE STRENGTH OR COLD WORKABILITY | : |

PRE-APPEAL BRIEF REQUEST FOR REVIEW

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Claims 1-21 are pending in this application. Claim 8 is independent. Claims 1-7 are withdrawn from consideration pursuant to a restriction requirement.

The present invention is directed to high-cleanliness steel having high fatigue strength and high cold workability. This is achieved by controlling the total-Li content of the steel to a specified range, by, e.g., adding a Li-containing substance (such as Si-Li alloy or $Li_2CO_3$) to molten steel, in order to limit the number of oxide inclusion particles having a major diameter of 20 $\mu$m or above in the steel. Specification at [0001], [0012], [0018], [0021].

Claims 8-21 are rejected under 35 U.S.C. 103(a) over JP63-140068 ("JP-068") in view of JP2002-167647 ("JP-647"), JP2002-194497 ("JP-497") and JP2003-027184 ("JP-184").

JP-068 fails to suggest the independent Claim 8 limitation of a "steel having a total-Li content between 0.020 and 9 ppm by mass". The Final Rejection at page 3, lines 19-20,

admits that "JP '068 **does not teach** the **presence of lithium** or limiting inclusions to less than 20 $\mu$m using a 50 gram sample." (Emphasis added).

The Final Rejection relies on JP-647 for suggesting these features. The Final Rejection asserts:

> While **JP '647** does not specifically provide the end Li concentration in the steel in ppm, one would reasonable expect a concentration overlapping the claimed range as **the inclusion $Li_2O$ content is in the range claimed in dependent claims 10 and 13**. Final Rejection at page 5, lines 19-21 (emphasis added).

> The technical reasoning used to assert that the prior art has the claimed Li content is the a function of the **lithium content bound in the inclusions**. The **amount of inclusions** can be determined by one of ordinary skill in the art based on analysis of the prior art processing methods. Thus while **JP '647** does not specifically provide the end Li concentration in the steel in ppm, one would reasonable expect a concentration overlapping the claimed range as **the inclusion $Li_2O$ content is in the range claimed in dependent claims 10 and 13**. Final Rejection at page 8, lines 16-22 (emphasis added).

Based on the dependencies of Claims 10 and 13 from independent Claim 8, the "**oxide inclusion particles**" featured in Claims 10 and 13 are "oxide inclusion particles having a major diameter of **20 $\mu$m or above**".

JP-647 discloses a steel containing inclusions containing 0.5 to 10% $R_2O$, where R is Na, K and Li. English-language machine translation of JP-647 at page 1. JP-647 is directed towards decreasing the maximum width (size) of inclusions to **below 10 $\mu$m** by increasing the amount of $SiO_2$ in inclusions from 42 to 75 mass%, or by increasing the amount of $R_2O$ (R is Na, K Li) in inclusions from 0.2 to 9.7 mass%. English-language machine translation of JP-647 at [0023]; Drawings 6-7.

However, JP-647 is silent about inclusions with diameters of 20 $\mu$m or above.

Contrary to the Final Rejection, JP-647's inclusion $Li_2O$ content in the range claimed in Claims 10 and 13 would **NOT** reasonably lead the skilled artisan to expect a concentration of Li in steel to overlap independent Claim 1's "total-Li content between 0.020 and 9 ppm", at

least because JP-647 does not suggest inclusion particles that feature both (i) the inclusion $Li_2O$ content of Claims 10 and 13 and (ii) the "major diameter of 20 $\mu$m or above" of the "oxide inclusion particles" of Claims 10 and 13.

Thus, the Final Rejection fails to provide any technical basis for the Final Rejection's apparent assertion that a concentration of $Li_2O$ in a metal oxide inclusion in a steel suggests a concentration of Li in the steel. MPEP §§ 2144.02 and 2144.03.

While JP-647 discloses a concentration of $R_2O$ (R is Na, K and Li) **in inclusions**, and discloses the frequency distribution of the width of inclusions (i.e., % of inclusions having each inclusion width), JP-647 is silent about the concentration of the inclusions **in the steel**. Without knowing the concentration of inclusions containing $Li_2O$ in steel, the skilled artisan cannot calculate the concentration of Li in the steel from a knowledge of the concentration of $Li_2O$ in the inclusions. To calculate the concentration of Li in steel from the concentration of $Li_2O$ in inclusions, the skilled artisan must be provided with the concentration of inclusions in the steel, a concentration that JP-647 fails to suggest.

Because JP-647 fails to suggest a concentration of inclusions in the steel, JP-647's disclosure of a concentration of $R_2O$ (R is Na, K and Li) in inclusions in the steel is not sufficient to suggest a total-Li content of the steel.

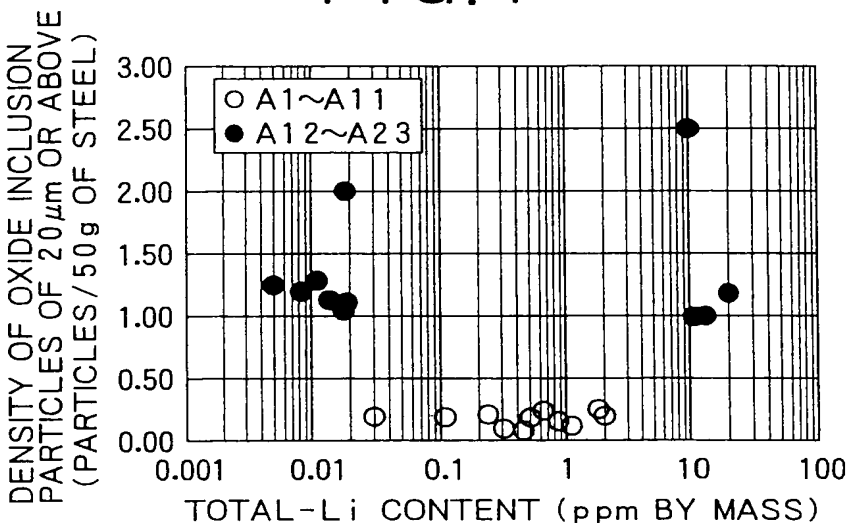
Thus, JP-647 fails to suggest the independent Claim 8 limitation of a "steel having a total-Li content between 0.020 and 9 ppm by mass".

The present inventors have discovered that when the total-Li content in the steel is limited to the range of 0.020 to 9 ppm by mass, the density of oxide inclusion particles of 20 $\mu$m or above is significantly reduced (see specification at Fig. 1), which provides improved cold workability and fatigue characteristics.

Because the cited prior art fails to suggest the independent Claim 8 limitation of a "steel having a total-Li content between 0.020 and 9 ppm by mass", the claims are not *prima facie* obvious.

Any *prima facie* case of obviousness based on the cited prior art is rebutted by the significant reduction in density of oxide inclusion particles of 20 μm or above (particles/50g of steel) that is achieved by the present invention over the independent Claim 8 range of "a total-Li content between 0.020 and 9 ppm by mass" and over the Claim 21 range of "a total-Li content between 0.020 and 6 ppm by mass". This is demonstrated in the specification at Fig. 1 (reproduced below).

FIG. 1




The data used to prepare Fig. 1 is found in the Declaration Under 37 CFR 1.132 filed September 26, 2008, at Table 1.

The Final Rejection asserts:

> In Fig. 1 there is no comparison of the closest prior art to establish superiority in harmful inclusion content. Final Rejection at page 9, lines 15-16.

However, the closest prior art is JP-068, the primary reference.

As discussed above, the Final Rejection at page 3, lines 19-20, admits that "JP '068 does not teach the presence of lithium".

Because the closest prior art of JP-068 does not contain Li, data for JP-068 (0 ppm Li) would not appear on Fig. 1 (where the total-Li content ranges from 0.001 to 100 ppm). Furthermore, because JP-068 does not contain Li, no comparative data showing how JP-068 varies with Li can be plotted on Fig. 1.

Thus, in Fig. 1 no comparison with the closest prior art, JP-068, is possible.

Thus, the superior effect achieved by the present invention with independent Claim 8's "steel having a total-Li content between 0.020 and 9 ppm by mass" is established over the closest prior art.

The cited prior art is silent about the significant reduction in density of oxide inclusion particles of 20 $\mu$m or above (particles/50g of steel) that is achieved by the present invention over the independent Claim 8 range of "a total-Li content between 0.020 and 9 ppm by mass" and over the Claim 21 range of "a total-Li content between 0.020 and 6 ppm by mass". The reduction in density of these oxide inclusion particles of 20 $\mu$m or above over these ranges of total-Li content provides the steel with improved cold workability and fatigue characteristics. There is no recognition in the cited prior art that controlling the total-Li content of steel controls the number of large oxide inclusion particles of diameter 20 $\mu$m or above.

Thus, any *prima facie* case of obviousness based on the cited prior art is rebutted.

Respectfully submitted,

Customer Number
22850
Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 08/07)

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.
Norman F. Oblon
Corwin Paul Umbach
Corwin P. Umbach, Ph.D.
Registration No. 40,211